Claims

[1] A method for producing a lithium composite oxide for use as a positive electrode active material for lithium secondary batteries, comprising the steps of:
subjecting an organic acid salt solution of metal elements constituting a final composite oxide other than lithium to a spray pyrolysis process to obtain an intermediate composite oxide powder; and
solid state-mixing the intermediate composite oxide powder and an organic acid salt of lithium, followed by thermally treating the mixture.

[2] The method according to claim 1, wherein the organic acid salt solution includes at least one metal element selected from the group consisting of Al, Co, Cr, Fe, Ni, Mn, Ni, Mg, Cu and Sb.

[3] The method according to claim 2, wherein the organic acid salt solution includes at least one metal element selected from the group consisting of Co, Mn and Ni.

[4] The method according to claim 1, wherein the organic acid salt solution is a mixed solution of $Mn(NO_3)_2 \cdot 4H_2O$ and $Ni(NO_3)_2 \cdot 6H_2O$.

[5] The method according to claim 4, wherein the intermediate composite oxide is an oxide represented by $(Ni_{1/2}Mn_{1/2})O_{2+y}$.

[6] The method according to claim 1 or 5, wherein the lithium composite oxide is an oxide represented by $Li_{1+x}(Ni_{1/2}Mn_{1/2})O_2$ (wherein $0 \leq x \leq 0.1$).

[7] The method according to claim 1, wherein the organic acid salt solution is a mixed solution of $Ni(NO_3)_2 \cdot 6H_2O$, $Co(NO_3)_2 \cdot 6H_2O$ and $Mn(NO_3)_2 \cdot 4H_2O$.

[8] The method according to claim 1, wherein the intermediate composite oxide is an oxide represented by $(Ni_{1/3}Co_{1/3}Mn_{1/3})O_{2+y}$.

[9] The method according to claim 1 or 8, wherein the lithium composite oxide is an oxide represented by $Li_{1+x}(Ni_{1/3}Co_{1/3}Mn_{1/3})O_2$ (wherein $0 \leq x \leq 0.1$).

[10] The method according to claim 1, wherein the final lithium composite oxide is an oxide represented by $Li_{1+x}(M_yMn_{(2-y)})O_4$ (wherein $0 \leq x \leq 0.1$, $0 \leq y \leq 0.5$ and M is at least one selected from the group consisting of Al, Co, Cr, Fe, Ni, Mg, Cu and Sb).

[11] The method according to claim 1, wherein the step of forming the intermediate composite oxide includes the sub-steps of:
measuring the amount of organic acid salts of metal elements constituting the final composite oxide other than lithium in the stoichiometric ratio of the

constituent metal elements;
dissolving the organic acid salts in distilled water or alcohol, adding a chelating agent thereto, and stirring the mixture; and
spraying the aqueous or alcoholic solution of the organic acid salts to form liquid droplets, and pyrolyzing the liquid droplets at about 400~1,000 °C, to form the intermediate composite oxide.

[12] The method according to claim 11, wherein the chelating agent is selected from the group consisting of tartaric acid, citric acid, formic acid, glycolic acid, polyacrylic acid, adipic acid, glycine, amino acids and PVA.

[13] The method according to claim 11, wherein the pyrolysis is performed in a vertical pyrolysis furnace.

[14] The method according to claim 1, wherein the thermal treatment is performed in the temperature range of about 400~1000°C.

[15] A lithium composite oxide produced by the method according to any one of claims 1 to 14.

[16] A lithium secondary battery manufactured using the lithium composite oxide produced by the method according to any one of claims 1 to 14, as a positive electrode active material.